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BOTANY.<sup>1</sup>

THE FLORA OF PALESTINE.—A general opinion seems to prevail, even among those who have visited the country, that though flowers are abundant in Palestine, especially during and immediately succeeding the rainy season, yet the number of species is remarkably small. This idea as to the paucity of species is scarcely correct. The multiplicity of species, and the large variety of peculiar forms are, in fact, in many cases, noticeable features of the flora.

As an example, I may state that I have collected, in the immediate vicinity of Jerusalem, eleven species of *Geranium*, including the *G. tuberosum*, that very distinct species with tuberous root. In this group, as in most others, the differentiation of the species is remarkably pronounced, being displayed not only in the form, color, number, furnishing and disposition of the blossoms, but also being exhibited in the great variation of the leaf, and even sometimes, as in the case of the species mentioned, passing into the character of the root.

I have had my attention attracted by the great number of cruciferous plants, as also those of a prickly or thorny nature. Indeed, genera whose species in other countries are usually smooth and unarmed, are here represented by species having prickly, spinous, or thorny appendages. It may be considered significant that in this land, where the great event (the central thought of Christianity) occurred, the plants should be found so frequently bearing the cross and wearing the thorns.

The number of garden plants which here grow wild has been commented on. To-day, I found on the rocky hills around Jerusalem the Narcissus and the Scarlet Anemone, Cyclamens, and the little blue-gray Iris, all in blossom. The Narcissus as well as Almond had been in flower for more than two weeks, and the Crocus and Orange for months; the fruit of the latter (confined to gardens) having been ripe since November. The Asphodels were pushing up their long stalks, heavy with buds, from among their spear-like leaves; and the purple Bugloss (*Echium violaceum*) hung from the cliffs. The very rocks seemed breaking out into blossom and praise.

In northern Palestine, in the months of March and April, after the effect of the rainy season has been felt, the bursting of the land into flower is a sight never to be forgotten. I have ridden on horseback, hour after hour, day after day, through miles of Scarlet Anemones and Ranunculus, Lupine, Scabious and Pheasant's-eye. Patches of vividly red Poppies, with fine black maculations, like eyes, edged with white, made matchless streaks of color. The

<sup>1</sup> Edited by Prof. Chas. E. Bessey, Lincoln, Neb.

purple *Gladiolus* sent up its graceful spires in the fields, and along the roadside trailed with great crimson bells the *Convolvulus jalapa*, and the smaller belled white *Convolvulus* with pale sulphur-colored rays. To see the Tulips (*Tulipa gesneriana*) breaking out of the hard dry soil of the very pathway, was a wonder, recalling the well-remembered description in Isaiah: "The wilderness and the solitary place shall be glad for them; and the desert shall rejoice and blossom as the rose." No artist, not even Turner himself, could do justice to the glorious colors of the landscape.—HENRY GILLMAN, *U. S. Consul, Jerusalem, Palestine, February 10th, 1888.*

THE ENTOMOPHTHOREÆ OF THE UNITED STATES.—These parasitic plants have been studied by Roland Thaxter, who has embodied his results in a monograph published in the Memoirs of the Boston Society of Natural History, Vol. IV., No. 6, bearing date of April, 1888. The order is now known to be a Zygomycete, related to the Mucorini, instead of Oöphyte with close relationship to the Saprolegniaceæ. This Thaxter confirms by his beautiful drawings of Zygosporangia, produced by a true conjugation.

The twenty-eight species described are arranged under three genera, viz.: *Empusa*, *Massospora*, and *Basidiobolus*. The name *Empusa*, proposed by Cohn in 1855, is very properly adopted in place of *Entomophthoreæ*, proposed by Fresenius in 1856. Sixteen new species are described, all of which belong to the genus *Empusa*. A synopsis, with hosts, as follows, may be of value to collectors and students:—

1. *Empusa muscæ* Cohn.—"Diptera: *Musca domestica*, *Lucilia caesar*, *Calliphora vomitoria*, and other large flies; also Syrphidæ of several genera."
2. *Empusa culicis* A. Braun.—"Diptera: Imagines of *Culex* and numerous genera of minute flies or gnats."
3. *Empusa grylli* (Fresenius) Nowakowski.—(*Entomophthora culicæ* Reich. and *Entomophthora calopteni* Bessey.) "Lepidoptera: Larvæ of many genera of Arctians and of *Orgyia nova*. Orthoptera: Larvæ, pupæ, and imagines of many genera of Acridians. Imago of *Ceuthophilus*. (?) Diptera: Larvæ and imagos of Tipulidæ, etc."
4. *Empusa tenthredinis* (Fresenius) Thaxter.—"Hymenoptera: Larvæ of Tenthredinidæ."
5. *Empusa conglomerata* (Gorokin) [?] Thaxter.—"Diptera: Larvæ and imagines of Tipulæ."
6. *Empusa apiculata* Thaxter.—"Lepidoptera: Larva of *Hyphantria textor*, imagines of *Fortrix* sp., *Deltoid* sp., *Petrophora* sp. (Geometrid). Diptera: Numerous genera of small flies or gnats. Hemiptera: Imago of a species of leaf-hopper (Typhlocyba)."

- Var. *major* Thaxter.—“Coleoptera: Imago of *Ptilodactyla serricollis*.”
7. *Empusa planchoniana* (Cornu) [?] Thaxter.—“Hemiptera: Several genera of Aphides.”
  8. *Empusa papillata* Thaxter.—“Diptera: Several minute gnats.”
  9. *Empusa caroliniana* Thaxter.—“Diptera: Imagines of *Tipula* sp.”
  10. *Empusa fresenii* Nowakowski.—“Hemiptera: *Aphis mali* and very many other aphides.”
  11. *Empusa lageniformis* Thaxter.—“Hemiptera: Usually aphides on *Betula populifolia*.”
  12. *Empusa lampyridæum* Thaxter.—“Coleoptera: Imago of *Chauliognathus pensylvanicus*.”
  13. *Empusa geometralis* Thaxter.—“Lepidoptera: Imagines of geometrid moths (*Petrophora*, *Eupithecia*, *Thera*, etc.).”
  14. *Empusa occidentalis* Thaxter.—“Hemiptera: Aphides on *Betula populifolia*.”
  15. *Empusa sphaerospermia* (Fres.) Thaxter (*E. radicans* Brifeld, *Entomophthora phytonomi* Arthur).—“Lepidoptera: Imago of *Colias philodice*; larva of *Pieris*. Hymenoptera: Ichneumonidæ of several genera and species, a small bee (near *Halictus*). Diptera: Imago of *Musca domestica*, *Musca* sp.; numerous small species belonging to the Culicidæ, Mycetophilidæ, Tipulidæ, and other families. Coleoptera: Larva of *Phytonomus punctatus*; imago of one of the Lampyridæ. Hemiptera: *Aphis* sp.; several species of *Typhlocyba* (leafhoppers), larvæ, pupæ, and imagines. Neuroptera: Imago of *Limnophilus*. Thripidæ: Larvæ, pupæ, and imagines of a species of Thrips on *Solidago*.”
  16. *Empusa aphidis* Hoffman.—“Hemiptera: Aphides of numerous genera.”
  17. *Empusa depterigena* Thaxter.—“Diptera: Small Tipulæ; other small flies or gnats, belonging especially to the Mycetophilidæ.”
  18. *Empusa virescens* Thaxter.—“Lepidoptera. Larvæ of *Agnotis fennica*.”
  19. *Empusa americana* Thaxter.—“Diptera: *Musca domestica*, *M. vomitoria*, *Lucilia cæsar*, and numerous other large flies.”
  20. *Empusa montana* Thaxter.—“Diptera: A minute gnat, apparently *Chironomus* sp.”
  21. *Empusa echinospora* Thaxter.—“Diptera: Imago of *Spromyza longipennis*, and (rarely) other smaller *Diplisa*.”
  22. *Empusa sepulchralis* Thaxter.—“Diptera: Imagines of *Tipulidæ*.”
  23. *Empusa variabilis* Thaxter.—“Diptera: Minute gnats of various genera.”

24. *Empusa rhizospora* Thaxter.—“Neuroptera: Several genera of Phryganeidæ (imagines).”  
 25. *Empusa gracilis* Thaxter.—“Diptera: On very minute gnats.”  
 26. *Empusa conica* Nowakowski.—“Diptera: Imagines of Chironomus and other small gnats.”  
 27. *Massospora cicadina* Peck.—“Hemiptera: Larvæ, pupæ, and imagines of *Cicada septendecem*.”  
 28. *Basidiobolus ranarum* Eidam.—“On the excrement of frogs.”

Collectors may be able to add to the species given above. As Mr. Thaxter desires to continue the investigation of the Entomogenous plants of North America, he desires correspondence upon this subject, with specimens in quantity. He should be addressed at New Haven, Conn. This little group ought now to receive a considerable attention at the hands of our botanists.—*Charles E. Bessey.*

A MINIA TURE TUMBLE-WEED.—On the great plains of Nebraska, from the altitude of two thousand five hundred to three thousand feet above sea-level, to and throughout the Rocky Mountain region there grows the very pretty little aster-like plant known as *Townsendia sericea* Hook. It blooms in early spring, and its pretty, almost sessile, heads of numerous flowers nearly cover the plant itself, so that one sees little more than a compound rosette of yellow and delicate pink close upon the ground.

After blossoming, the bracts of the involucre remain for a considerable time widely opened, but when the achenes are ripe the involucre closes and forces out the mass of achenes, with their abundant long, white pappus and effete corolla tubes. This expulsion was observed

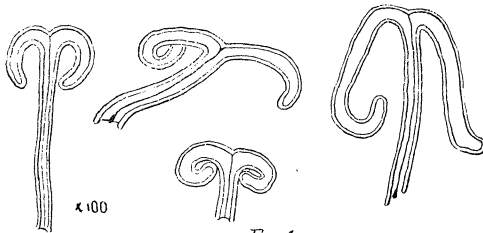


Fig. 1

to take place, in one instance, in a plant grown in my laboratory with such force as to suddenly throw the mass of achenes and pappus out free from the involucre. I suppose that the spreading of the pappus has also much to do with freeing the achenial mass from the involucres. Possibly the pappus and involucres act together.

The achenes are pretty well covered with long twisted and bent “duplex” hairs, as is common in this and many allied genera.<sup>1</sup>

<sup>1</sup> As shown by Professor Macloskie, in his paper on “Achenial Hairs and Fibres of Compositæ.” American Naturalist, Vol. XVII., p. 31; and also “Achenial Hairs of Townsendia.” Ibid., p. 1102.

The extremities of the hairs are recurved into double hooks, as shown in the accompanying cut (Fig. 1). The body of the hair (as shown by Macloskie) is composed of two parallel, greatly-elongated cells, each of which is recurved, thus forming the double hook. In some instances I have observed septa in one or other of the cells, although for the most part they are wanting. The hairs upon each achene become interwoven with those of neighboring achenes, and, upon drying and twisting, they firmly bind together all the achenes of each head. The spreading pappus forces the mass to take an ellipsoid form as soon as it has escaped from the involu-  
lucer (as shown in Fig. 2).

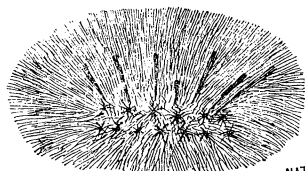


Fig. 2.

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Lying now upon the surface of the plant, and entirely freed from the embrace of the involu-  
lucer, the light mass is ready to begin its career as a miniature "tumble-weed." After a few rolls it loses most of the effect of corolla tubes and tumbles lightly along upon the points of its spreading pappus.

The jarring gradually separates the tumbling ball; but even when it breaks in two, each part rounds up again by the wide spreading of the pappus and rolls on again before the brisk breeze of the plains, dropping here and there an achene with its hidden seed, just as the great tumble-weeds, *Amaranthus*, *Cycloloma*, *Corispermum*, etc., do in their larger way.—*Charles E. Bessey*.

UNDERWOOD'S FERNS AND THEIR ALLIES.<sup>1</sup>—This little book, the first and second editions of which were noted in the *NATURALIST* at the time of their appearance, has been entirely re-written; and while the general plan of the former editions has not been materially modified, the details have undergone very considerable changes. The present edition contains thirty-four pages more of matter than the last, and this increase is divided between the general matter (which gains nineteen pages) and the systematic portion, which is increased fifteen pages.

This increase in the number of pages is due to the new matter introduced in the general part, consisting mainly of excellent references to the literature of the subject, and in the systematic part to a considerable increase in the number of species. The glossary is also much increased in volume and value.

The book is a most useful and handy one, and will enable the student of the Pteridophytes to obtain an excellent idea of their structure and classification.

<sup>1</sup> Our Native Ferns and Their Allies, with Synoptical Descriptions of the American Pteridophyta north of Mexico. By Lucien M. Underwood, Ph.D., Professor of Biology in Syracuse University. Third Edition, revised. New York: Henry Holt & Co., 1888. 16mo, pp. xi., 156.

We regret that the author did not abandon the term *frond*, which our present knowledge of the comparative anatomy of plants ought to soon render obsolete. *Frond* and *stipe* ought not to be tolerated longer; we should say *leaf* and *petiole*; for a "frond" is only a leaf and a "stipe" is only a petiole.

In the chapter on "The Fern's Place in Nature," the author adopts the term *Spermaphyta* for the flowering plants, and gives an excellent list of systematic works for the different classes of the vegetable kingdom.—*Charles E. Bessey*.

## ZOOLOGY.

AMERICAN NEMATOGNATHI.—The peculiar connection between the air-bladder and hearing apparatus of the Nematognathi has received considerable attention from comparative anatomists. *Cetopsis*, the families *Argeidæ*, *Loricariidæ*, *Callichthyidæ*, and *Hypophthalmidæ* were said by Johannes Müller and by Valenciennes to be destitute of an air-bladder, and consequently of the auditory ossicles. Reisner, Day, Sagemehl, and Wright have successively proved the presence of an air-bladder encased in bone in all the forms except *Cetopsis*. In connection with a Revision of the South American Nematognathi we have examined *Cetopsis*, and have also made observations on the *Loricariidæ*, *Callichthyidæ*, *Hypophthalmidæ*, *Siluridæ*, *Pygidiidæ*, and *Bunocephalidæ*. *Cetopsis* agrees in general with the *Pygidiidæ* (= *Trichomyteridæ*). The enclosure of the air-bladder in a bony capsule in the Nematognathi of America instead of being the exception is the rule, modifications of the enclosed air-bladder being the case in all the families but the *Siluridæ* and *Bunocephalidæ* (= *Aspredinidæ*).

A hint as to the method by which the air-bladder was enclosed may be detected by a comparison of *Ageneiosus* and *Hypophthalmus*. In *Hypophthalmus* the air-bladder is half bony, half membranaceous, the bony portion being attached to the modified vertebræ; the whole air-bladder is surrounded above and behind by the lateral processes of the modified vertebræ, below partly by lateral processes of the vertebræ, mostly by the processes connecting the scapula with the basioccipital, anteriorly partly by the expanded scapula. The scapular process in *Hypophthalmus* extends from the basioccipital backward and outward. If now the coalesced vertebræ could be lengthened so as to separate the scapular process from the lateral processes almost the exact conditions would be obtained which are found in *Ageneiosus*. Like *Hypophthalmus*,